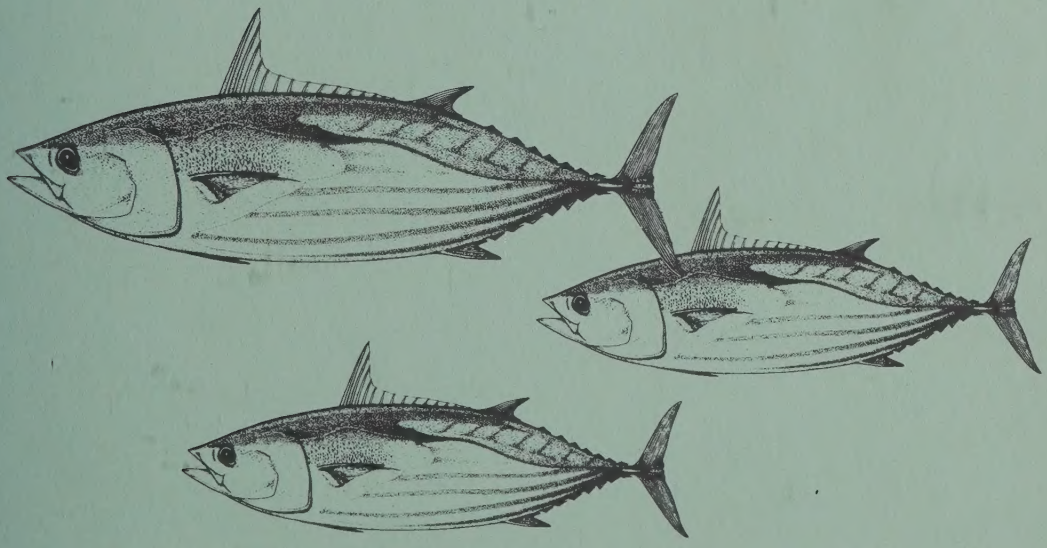
DECEMBER 1979
No. 12

FISHING INFORMATION

Southwest Fisheries Center-La Jolla, California



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U.S. DEPARTMENT OF COMMERCE
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FISHING INFORMATION

DECEMBER 1979, No. 12

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I. Barrett, Director, SOUTHWEST FISHERIES CENTER
J. Carr, Deputy Director

PREFACE

This publication, Fishing Information, appears monthly and contains 1) fishery advisory information, 2) a narrative description of pertinent surface temperature conditions, 3) charts of winds and pressures for the eastern North Pacific, 4) charts of sea surface temperature for the North Pacific and eastern tropical Pacific, and 5) charts of subsurface temperature structure in the eastern North Pacific.

A supplement to Fishing Information appears at 15-day intervals throughout the year. It contains a chart of sea surface temperature (contoured at $2^{o}F$ ($1^{o}C$) intervals) from Baja California to Vancouver Island out to about $135^{o}W$. Special bulletins are published in conjunction with the 15-day sea surface temperature charts which include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate during the albacore fishing season.

To cancel delivery of this publication in the event you no longer need to receive it, or to change the delivery address if you are moving but still need to receive it, please notify us by writing: James A. Renner, Editor, Fishing Information, National Marine Fisheries Service, Southwest Fisheries Center, P. O. Box 271, La Jolla, California 92038.

Submitted for publication - January 31, 1980

CONTENTS

	Page
Acknowledgements	iv
Sea Surface Temperature and Environmental Conditions - December 1979 Forest R. Miller	1
ENVIRONMENTAL CHARTS, PACIFIC OCEAN - December 1979	
Figure 1. Nineteen-year mean (1961-1979) observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots) and average winds speed (knots) regardless of direction.	4
Figure 2. Observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots) and average wind speed (knots) regardless of direction.	5
Figure 3. Mean sea surface temperature, eastern North Pacific Ocean. Numerals on shore are temperatures at coastal and lightship stations.	6
Figure 4. Mean sea surface temperature chart, western North Pacific Ocean.	7
Figure 5. Deviation of sea surface temperatures, eastern North Pacific Ocean from 20-year mean (1948-67). Hatched areas are colder in 1979.	8
Figure 6. Deviation of sea surface temperatures, western North Pacific Ocean from 20-year mean (1948-67). Hatched areas are colder in 1979.	9
Figure 7. Deviation of sea surface temperatures, eastern North Pacific Ocean from those of December 1978. Hatched areas are colder in 1979.	10
Figure 8. Mean sea surface temperatures, eastern tropical Pacific Ocean.	11
Figure 9. Deviation of sea surface temperatures, eastern tropical Pacific Ocean from 20-year mean (1948-67). Shaded areas are colder in 1979. Contours are dashed in sparse data areas.	12
Figure 10. Surface temperature and salinity and subsurface temperature structure from expendable bathythermograph observations between San Francisco and Honolulu. December 2-7, 1979.	13

ENVIRONMENTAL CHARTS ANALYZED BY:

F. Miller (Figures 8 and 9)
J. Renner (Figures 1, 2, 3, 4, 5, 6, 7, and 15-day Supplement)

TECHNICAL EDITOR:
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  J. Redhead at Langara Island Light;
  R. Dobinson at Cape St. James Light;
  R. W. Moe at Kains Island Light;
  M. V. Stewart at Amphitrite Point Light

Scripps Institution of Oceanography, La Jolla, California

Expendable bathythermograph and salinity observations are made by the mates and engineers of the *Maunawili* of the Matson Navigation Company. The data are processed under supervision of D. R. McLain at the NMFS Pacific Environmental Group, Monterey, California, using computer facilities of the Fleet Numerical Weather Central, Monterey. The project is partially supported by the National Science Foundation and the Office of Naval Research.

Sea Surface Temperature and Environmental Conditions

Forrest R. Miller

Eastern North Pacific

During December the greatest cooling in sea surface temperatures (SST) normally occurs in a broad zone between the Aleutian low and the Pacific high pressure centers (40^{o}-50^{o}N). The Aleutian low is normally centered near 60^{o}N, 145^{o}W and the Pacific high near 32^{o}N, 135^{o}W (Figure 1). The north Pacific Ocean front usually lies along the southern boundary of the maximum cooling zone (35^{o}-40^{o}N), and weather fronts frequently develop over the warm side of the ocean frontal zone and move rapidly eastward.

During December 1979 the Aleutian low was centered near 55^{o}N and 147^{o}W and the eastern Pacific high pressure center was at 30^{o}N, 130^{o}W (Figure 2). The Aleutian low was closer to its normal position and intensity in December than in November 1979. The high pressure center was weak and east of its normal location with a high pressure ridge over the southwestern U.S. Between the Aleutian low and Pacific high, surface westerly winds were stronger than normal east of 150^{o}W in association with frequent, intense storms that moved across British Columbia and the U.S. west coast north of 35^{o}N. South of 35^{o}N weather fronts were usually blocked by the high pressure ridge. Over the Central Pacific from 150^{o}W to 170^{o}W, a broad low pressure trough extended southwest from the Aleutian low and persisted most of the month. Storms moved eastward from the western Pacific and intensified in the trough south of the Aleutian low. As a result, heavy bands of weather and very strong surface winds caused heavy seas and severe weather from the Gulf of Alaska to the Hawaiian Islands. During November 1979 a similar low pressure trough extended from the Aleutian low southward to 20^{o}N between 130^{o}W and 155^{o}W.

The SST pattern (Figure 3), with isotherms bulging northward east of 140^{o}W, reflected the above normal SST's that have persisted along the west coast of north America for several months. From 145^{o}N to 170^{o}W and south of 45^{o}N, the isotherms were depressed southward, and there was no well defined north Pacific Ocean front east of 170^{o}W. In the Gulf of Alaska, SST's were more than 1^{o}C above normal (Figure 5) along 145^{o}W. The relatively warm water in the Gulf of Alaska was due, in part, to a more southerly wind flow than normal east of 145^{o}W. Although surface winds were stronger than normal in the Gulf during December, seasonal SST cooling rates were probably reduced because of northward advection of warmer water along the eastern periphery of the Aleutian low. SST's were 1^{o} to 2^{o}C greater than in December 1978 over most of the Gulf north of 55^{o}N and along the entire British Columbia and U. S. coastline (Figure 7). Sputh of 35^{o}N between 125^{o}W and 145^{o}W an elongated area of SST's more than 1^{o}C above normal has persisted since October 1979. The eastward displacement of the high pressure center, combined with below normal surface winds and cloud cover, have been contributing factors in this very large area of above normal SST's which extends along the coast from southern California to Baja California and southwestward to the Hawaiian Islands. This area experienced SST's from 1^{o} to 2^{o}C greater than one year ago (Figure 7). West of 145^{o}W from 25^{o}N to 45^{o}N, SST's were more than 1^{o}C below normal where heavy surface wind mixing and above normal cloud cover, associated with intense storms, caused SST's to cool at faster than seasonal rates. The heavy ocean mixing was especially great in the low pressure trough where Pacific storms became very intense between the Aleutian low and the Hawaiian Islands. There was considerably more ocean mixing and storm activity centered around 40^{o}N, 150^{o}W in December 1979 than in December 1978. SST's were more than 2^{o}C colder than a year ago (Figure 7).

Western North Pacific

During December the western Pacific high pressure system dominated the surface wind circulation from 20°N to 35°N and east of 160°E and as far north as 40°N between Japan and 160°E. The westward extension of the Aleutian low pressure system controlled the circulation north of 40°N. However, both of the high and low pressure systems were near normal and the westerly wind circulation over the north Pacific was not as strong as in November.

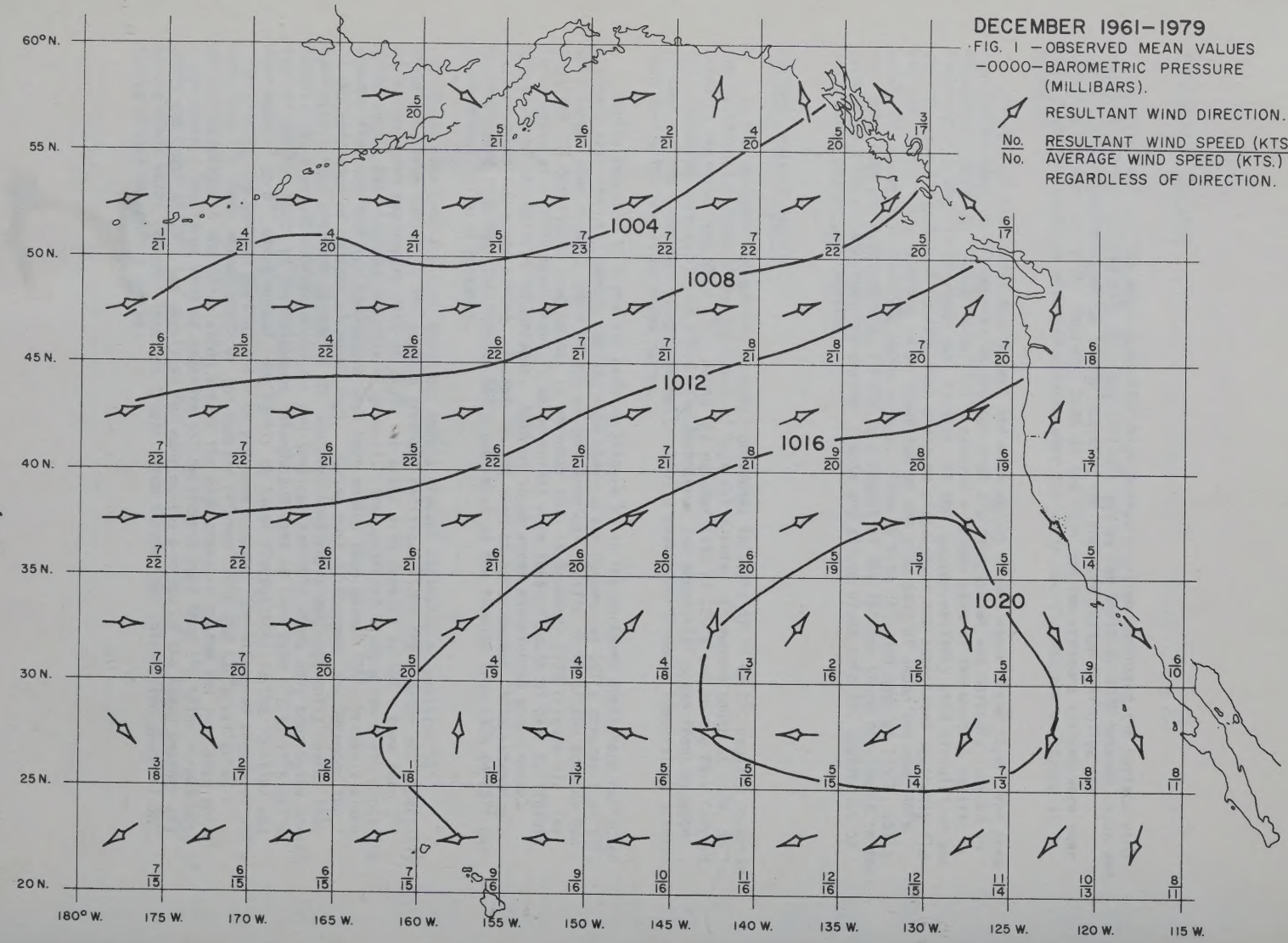
Because of less storm development and wind mixing in the upper ocean layer, the area covered by negative SST departures greater than 1°C from normal was markedly reduced in December (Figure 6). Above normal SST's covered a larger part of the western Pacific north of 35°N than in November due, in part, to the weaker westerly wind circulation and the frequent influence of Pacific high pressure circulation and associated southerly flow west of 150°E. This resulted in an expansion of the area east of Japan and near 40°N where SST's were more than 1°C above normal. From 25°N to 35°N and east of 175°E, SST's were more than 1°C below normal, partly as a result of the intense storm develoment in the central Pacific and the trailing weather fronts and strong winds into the subtropics of the central and western Pacific.

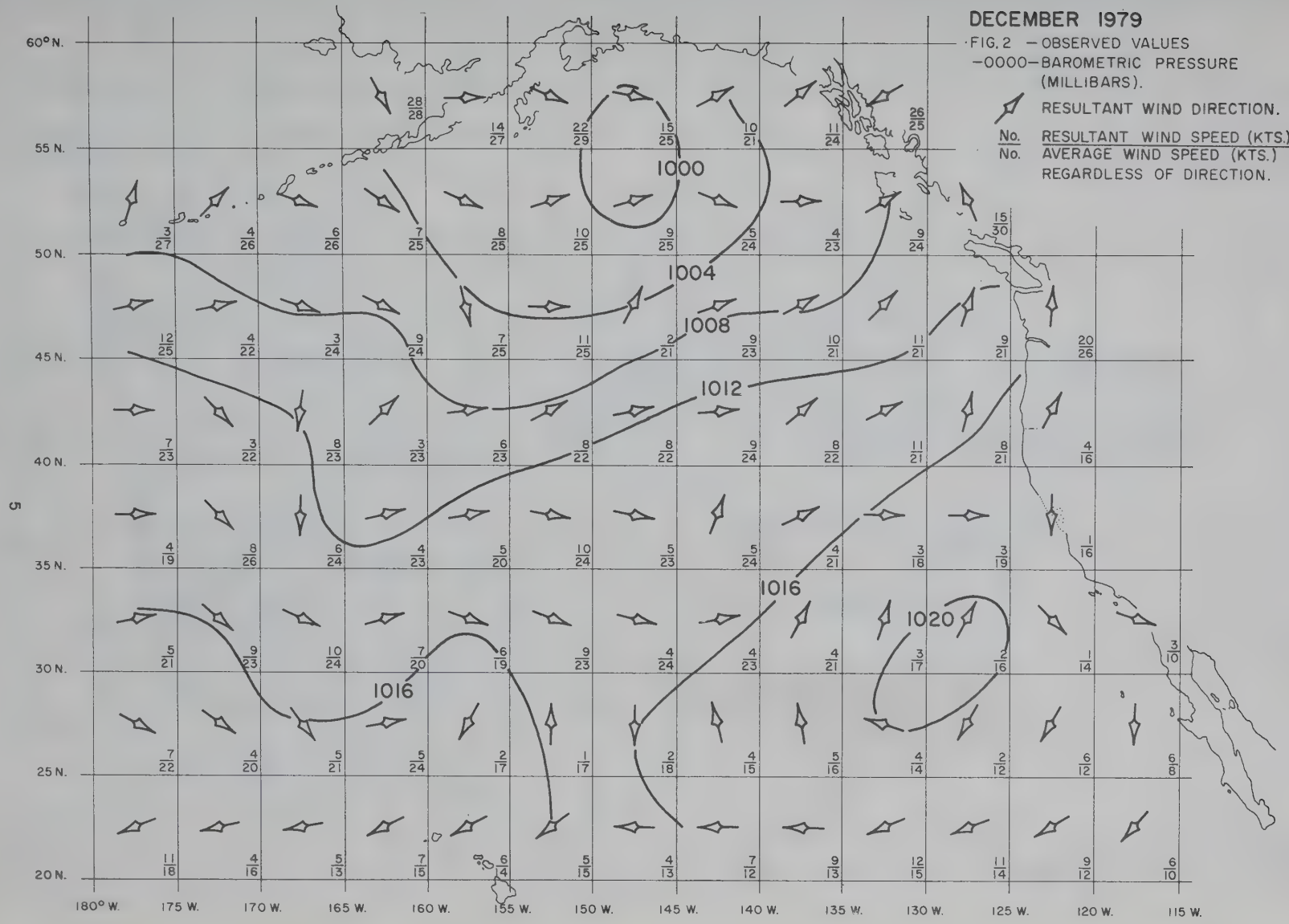
Eastern Tropical Pacific

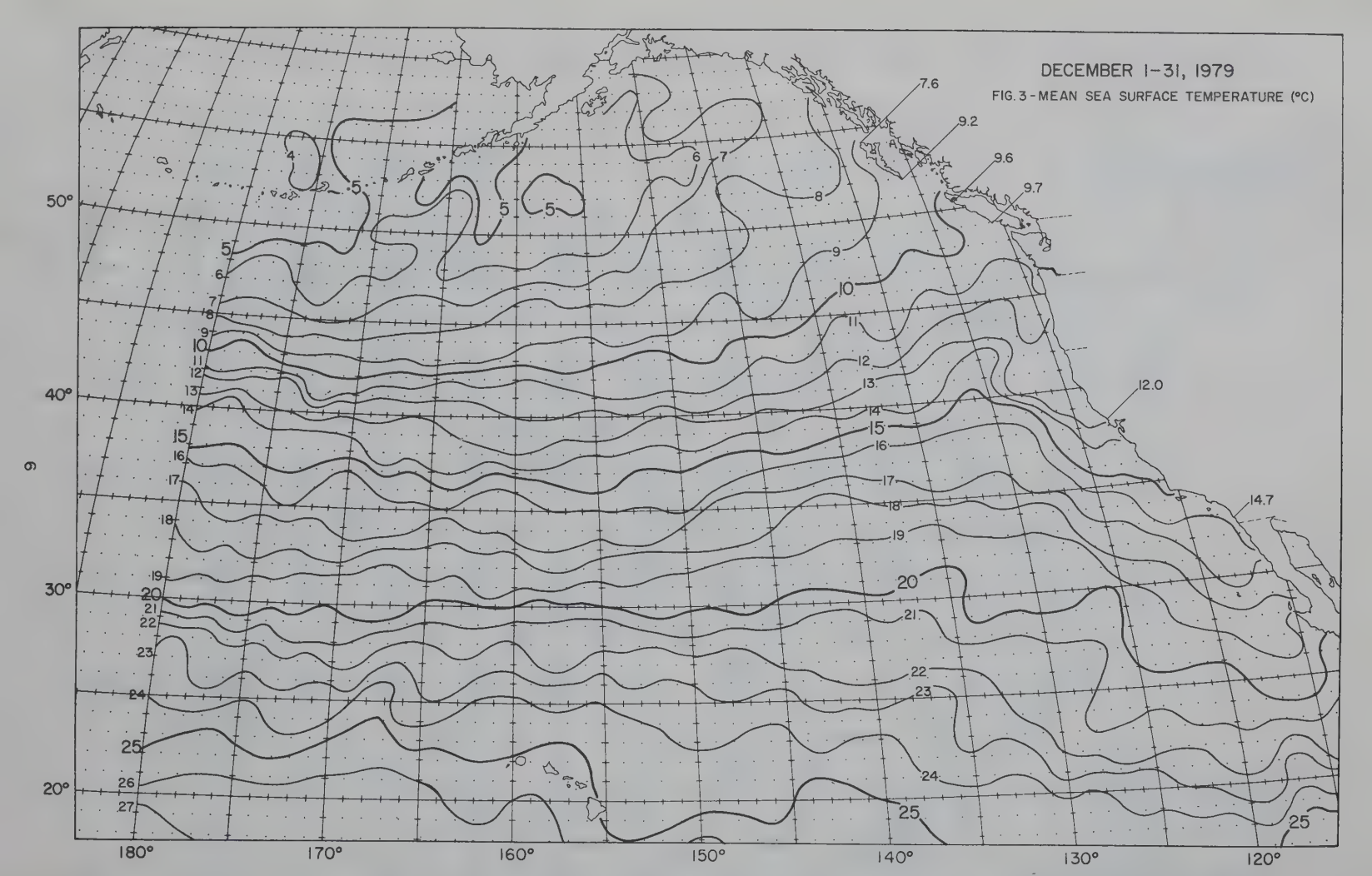
In the northern hemisphere, seasonal decreases in SST's of 1° to 2°C usually occur in the California Current along the coast of Baja California. Elsewhere south of 25°N, SST's normally decrease less than 1°C. Along the equator east of 120°W and in the Peru Current, SST's normally increase 1° to 2°C during December. The equatorial ocean front between Ecuador and the Galapagos Islands normally shows a weaker north-south temperature gradient than during the preceding three months.

During December 1979 the SST pattern (Figure 8) in the northern hemisphere reflected slightly less than the normal cooling rate where areas covered by SST's greater than 27°C were larger than normal. More of the eastern tropical Pacific north of the equator had positive SST departures from normal in December than in November 1979 (Figure 9). The three areas with SST's more than 1°C below normal were located south of Baja California and south of the Gulf of Tehuantepec. Both of these areas experienced above normal surface winds and ocean mixing. Except for the band of below normal SST's extending southeastward from Baja California, SST's over most of the tropics from 15°N to 15°S had above normal SST's in December.

During the past 3 months there has been a gradual expansion of positive SST departures from normal in the eastern tropical Pacific. Along the equator and especially in the southern hemisphere east of 130°W the ocean area covered by SST's more than 1°C above normal has expanded markedly (Figure 9). The southeast trade winds which cross the equator from the southern hemisphere have been weaker than normal (this probably aided in the reduction of equatorial upwelling). During most of November and December the subtropical high pressure system in the southern hemisphere was apparently weaker than normal. As a result surface pressures and tropical easterly winds have been below normal east of 130°W. South of the Galapagos Islands and west of Peru from 5°S to 12°S SST's have been 1° to 2°C above normal, due partly to large fluctuations in the location and intensity of the eastern part of the high pressure system. The extensive region of SST's more than 1°C above normal south of the equator between 100°W and 130°W reflected a general weakness in the circulation around the high pressure system and less than normal cloud cover. The large area of negative SST departures more than 1°C below normal west of 140°W and south of 10°S has persisted for many months because of the heavy weather and strong winds which extended into the tropics from storms that intensified south of 30°S during winter and spring months.

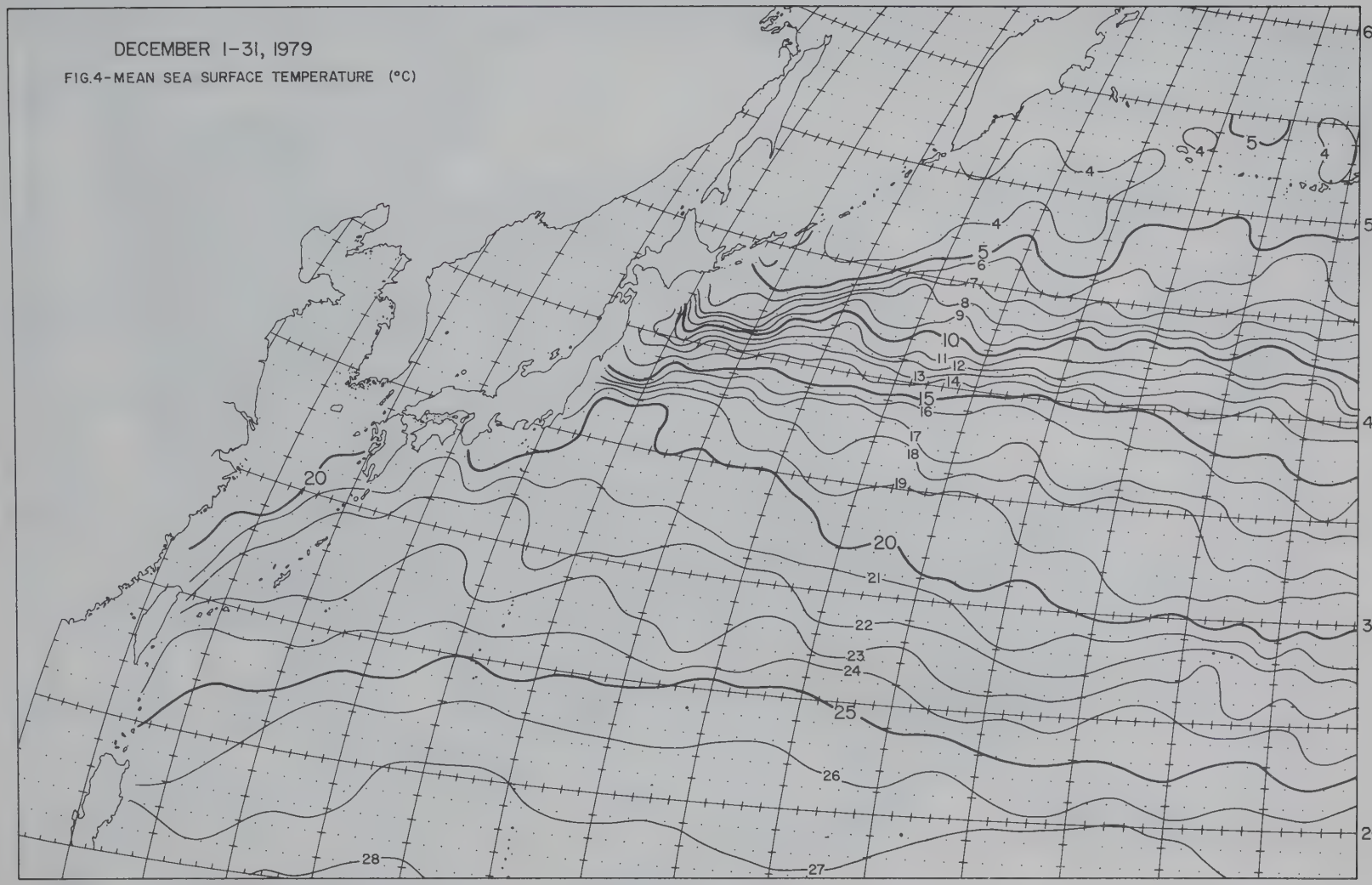

DECEMBER 1961–1979
FIG. 1 – OBSERVED MEAN VALUES
–0000– BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.)
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1004
1008
1012
1016
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

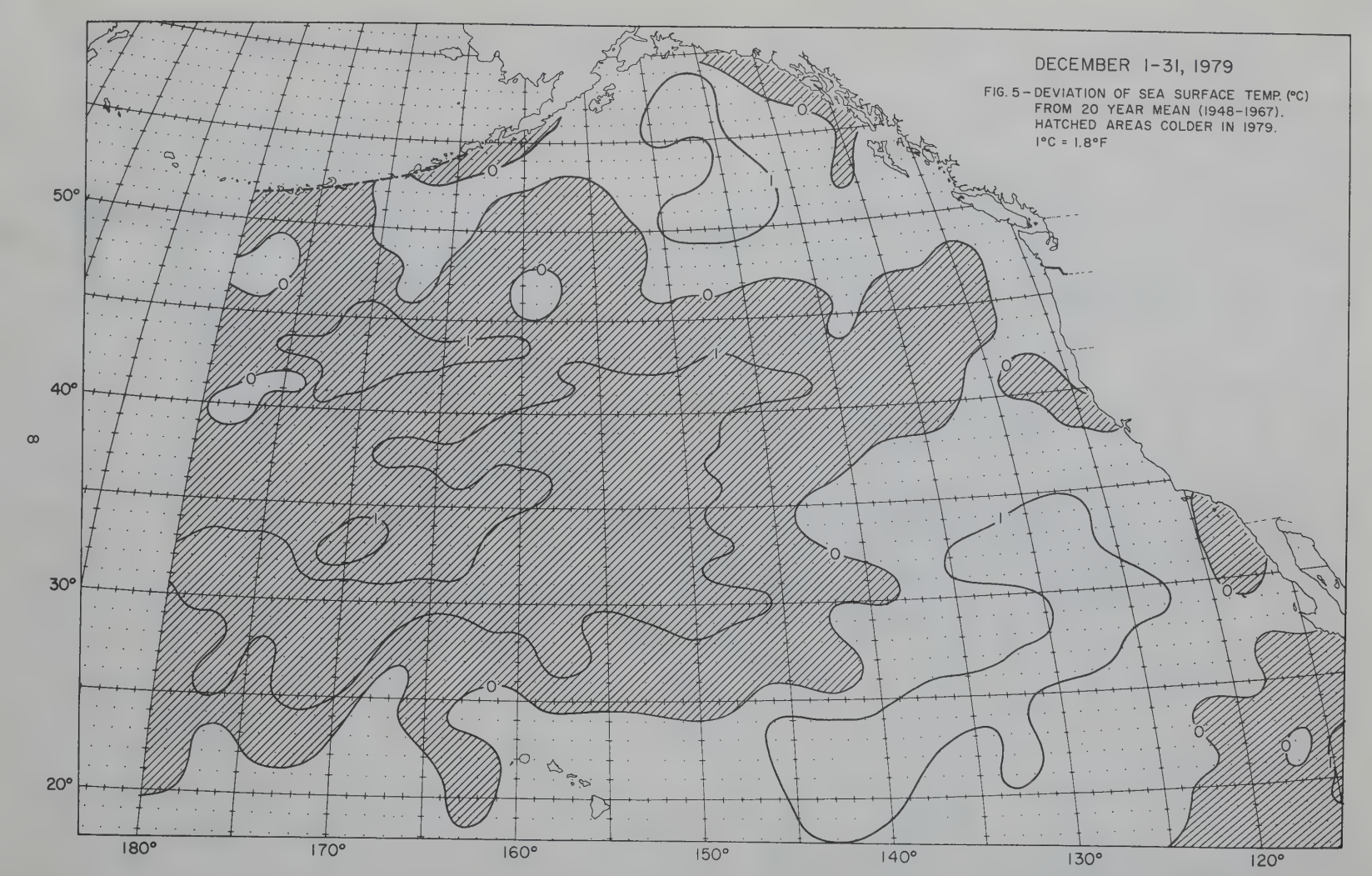

DECEMBER 1979
FIG. 2 — OBSERVED VALUES
—0000— BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.)
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1000
1004
1008
1012
1016
1020
1016
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

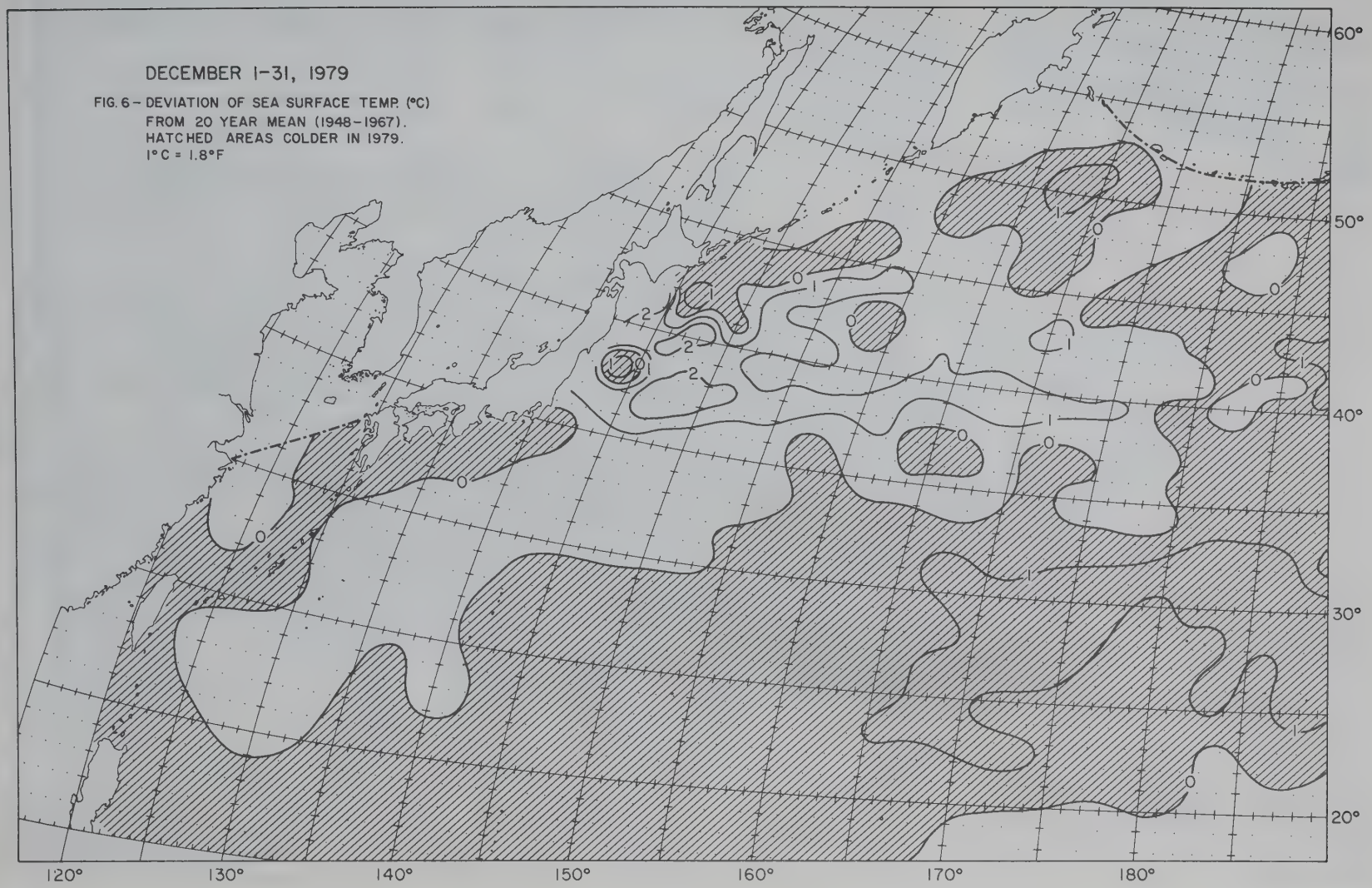

DECEMBER 1-31, 1979
FIG. 3 - MEAN SEA SURFACE TEMPERATURE (°C)
7.6
9.2
9.6
9.7
12.0
14.7
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°

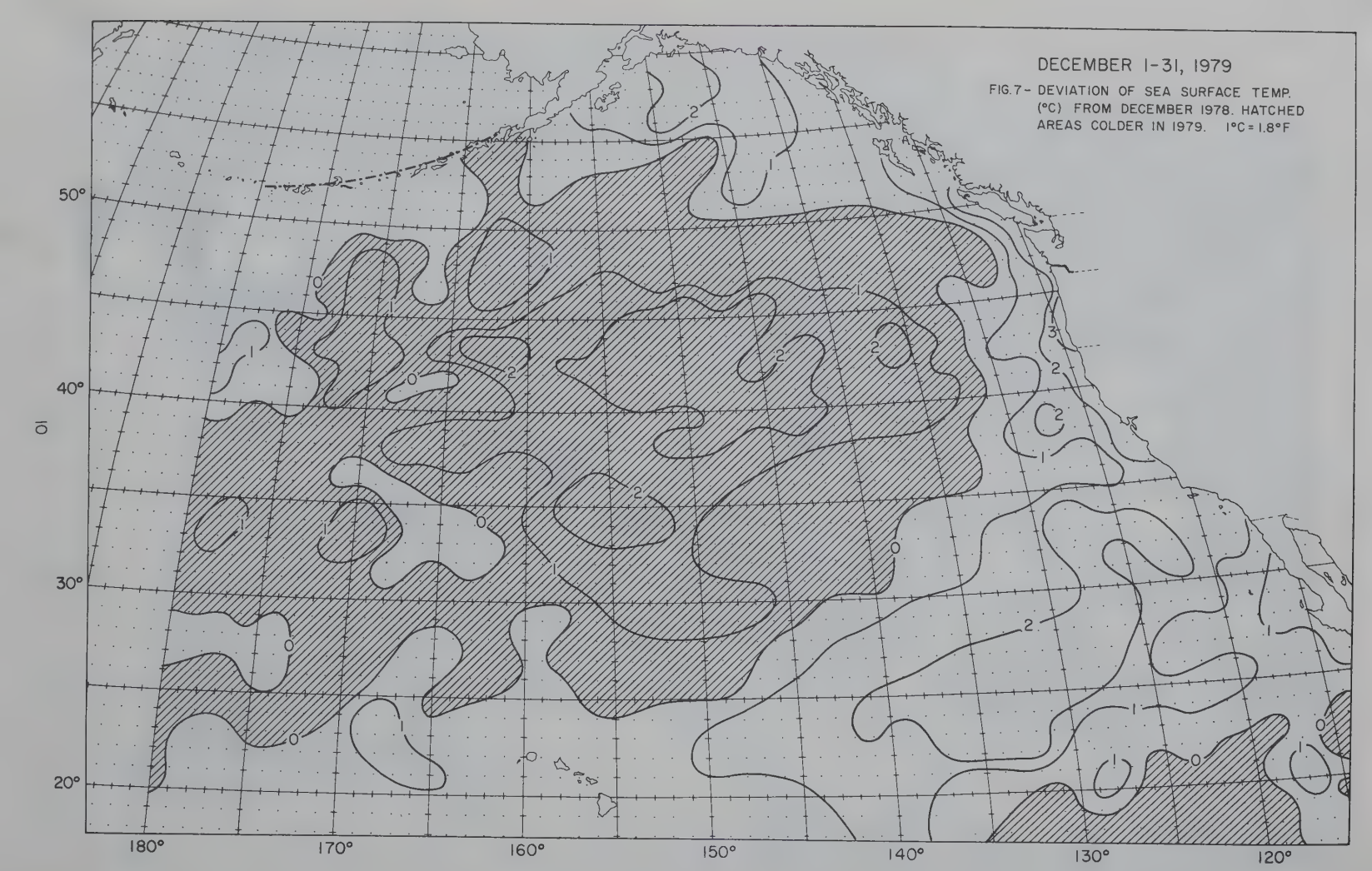
DECEMBER 1-31, 1979

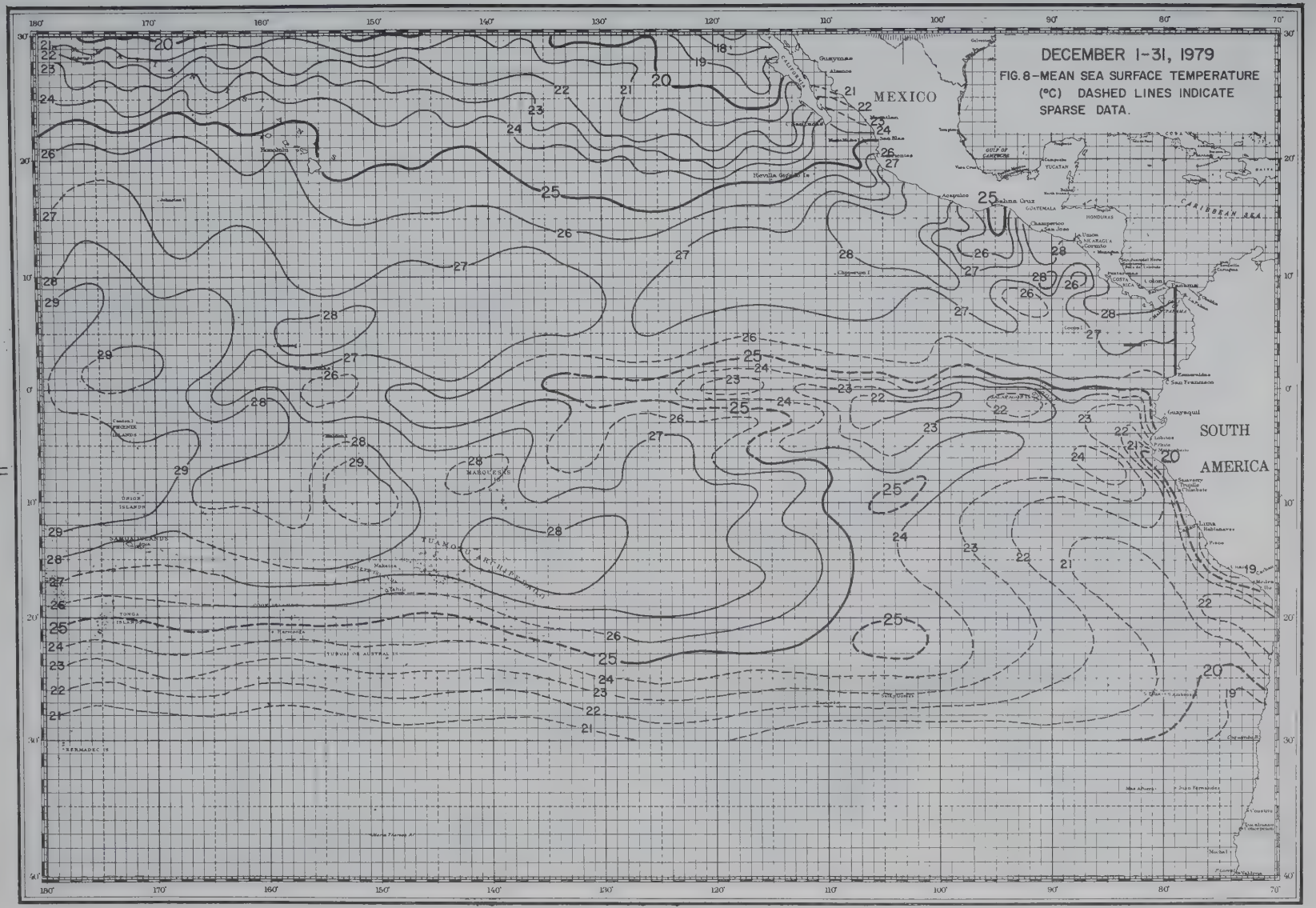
FIG.4-MEAN SEA SURFACE TEMPERATURE (°C)

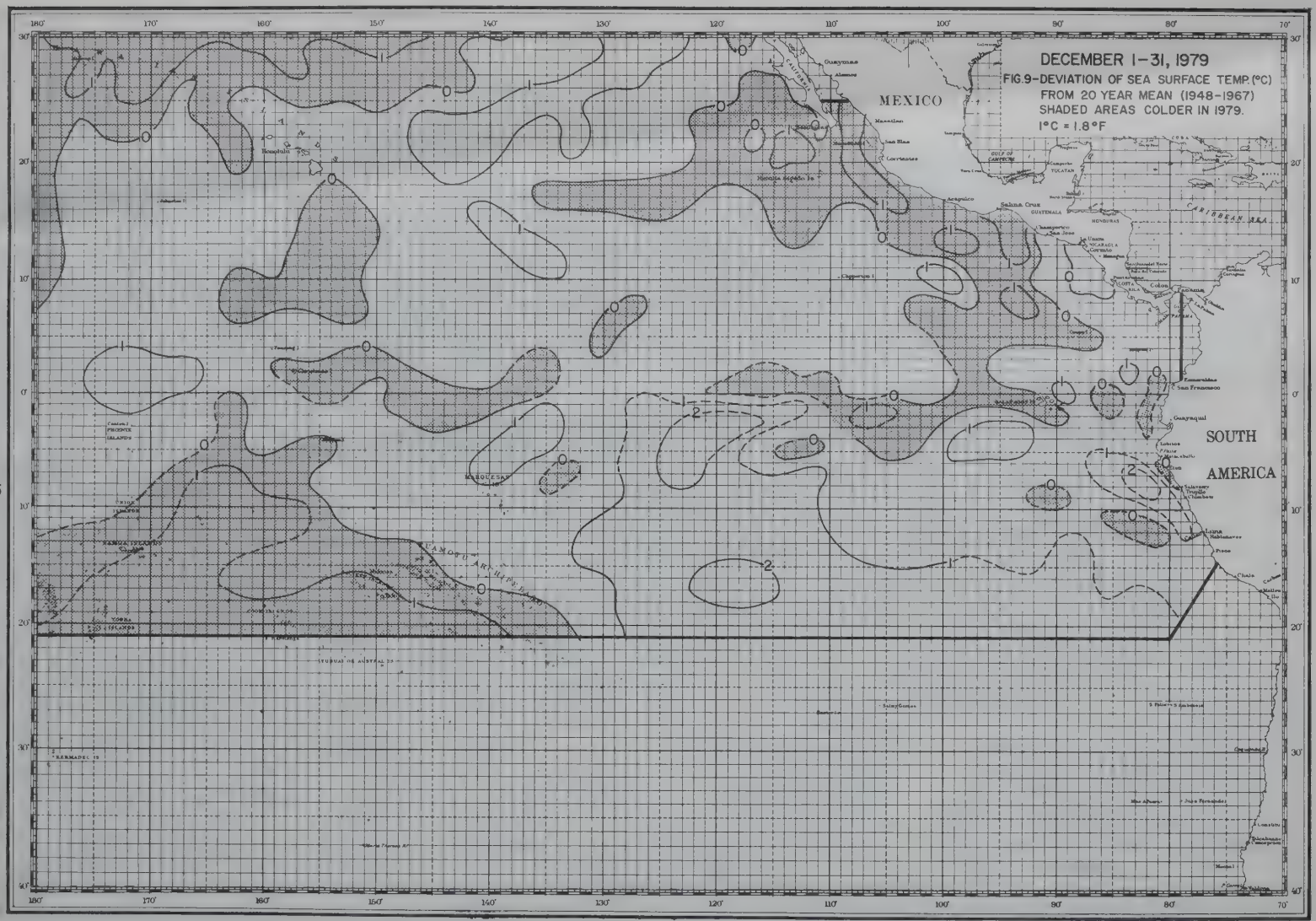



DECEMBER 1-31, 1979
FIG. 5 – DEVIATION OF SEA SURFACE TEMP. (°C) FROM 20 YEAR MEAN (1948-1967). HATCHED AREAS COLDER IN 1979.
1°C = 1.8°F
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
0
1


DECEMBER 1-31, 1979
FIG. 6 – DEVIATION OF SEA SURFACE TEMP. (°C)
FROM 20 YEAR MEAN (1948–1967).
HATCHED AREAS COLDER IN 1979.
1°C = 1.8°F
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


DECEMBER 1-31, 1979
FIG.7- DEVIATION OF SEA SURFACE TEMP. (°C) FROM DECEMBER 1978. HATCHED AREAS COLDER IN 1979. 1°C = 1.8°F
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°


DECEMBER 1-31, 1979
FIG. 8-MEAN SEA SURFACE TEMPERATURE (°C) DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
GUATEMALA
HONDURAS
COSTA RICA
PANAMA
COLOMBIA
ECUADOR
PERU
CHILE
Acapulco
Salina Cruz
Guayaquil
Lima
Callao
Arica
Iquique
Antofagasta
Valparaiso
Easter Island
Galapagos Islands
Clipperton I.
Cocos I.
Malpelo I.
San Felix
San Ambrosio
Juan Fernandez Is.
Robinson Crusoe I.
Tuamotu Archipelago
Tahiti
Marquesas Is.
Tubuai Is.
Austral Is.
Tonga Islands
Union Islands
Phoenix Islands
Marquesas
Nassau I.
Penrhyn I.
Manihiki I.
Rakahanga I.
Pukapuka I.
Samoa Is.
Bermadec Is.
Kermadec Is.
Norfolk I.
Lord Howe I.
Tasman Sea
Coral Sea
Gulf of California
Gulf of Tehuantepec
Gulf of Panama
Gulf of Guayaquil
Gulf of Fonseca
Gulf of Nicoya
Gulf of Papagayo
Gulf of Chiriqui
Gulf of Dulce
Gulf of Montijo
Gulf of Arauco
Gulf of Penas
Gulf of Corcovado
Gulf of Ancud
Gulf of Guacamayas
Gulf of Almejas
Gulf of Campeche
Gulf of Honduras
Gulf of Mexico
Gulf of Yucatan
Gulf of Darien
Gulf of Tribugá
Gulf of Buenaventura
Gulf of Tumaco
Gulf of Guayaquil
Gulf of Panama


DECEMBER 1-31, 1979
FIG.9-DEVIATION OF SEA SURFACE TEMP.(°C)
FROM 20 YEAR MEAN (1948-1967)
SHADED AREAS COLDER IN 1979.
1°C = 1.8°F
MEXICO
SOUTH
AMERICA
CARIBBEAN SEA
GUATEMALA
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
Guayaquil
San Francisco
Colon
Aspulco
Salina Cruz
Manzanillo
San Blas
Lorenzillo
Hanolulu
Midway Is.
Johnston I.
Canton I.
Phoenix Is.
Christmas I.
Fanning I.
Tarawa
Gilbert Is.
Ellice Is.
Samoa
Tokelau Is.
Tuvalu (Ellice Is.)
Fiji Is.
Suva
Tonga
Kermadec Is.
Norfolk I.
Lord Howe I.
New Caledonia
Loyalty Is.
Vanuatu
Solomon Is.
Bougainville
Rabaul
Truk
Yap
Palau Is.
Guam
Marcus I.
Wake I.
Marshall Is.
Kwajalein
Enewetak
Marcus I.
Bonin Is.
Volcano Is.
Ryukyu Is.
Taiwan
Okinawa
Miyako
Amami
Kyushu
Honshu
Hokkaido
Kuril Is.
Aleutian Is.
Attu
Kodiak
Alaska
Yukon
Mackenzie
Hudson Bay
Greenland
Iceland
Ireland
Scotland
Norway
Sweden
Finland
Russia
Europe
Asia
Africa
Australia
New Zealand
Antarctica
Arctic Ocean
Pacific Ocean
Atlantic Ocean
Indian Ocean
Mediterranean Sea
Black Sea
Caspian Sea
Red Sea
Persian Gulf
Arabian Sea
Bay of Bengal
South China Sea
East China Sea
Sea of Japan
Sea of Okhotsk
Bering Sea
Gulf of Alaska
Gulf of California
Gulf of Mexico
Caribbean Sea
Mediterranean Sea
Black Sea
Caspian Sea
Red Sea
Persian Gulf
Arabian Sea
Bay of Bengal
South China Sea
East China Sea
Sea of Japan
Sea of Okhotsk
Bering Sea
Gulf of Alaska
Gulf of California
Gulf of Mexico
Caribbean Sea

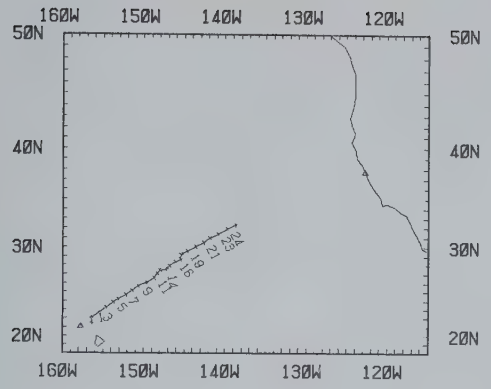


FIGURE 10

SHIP MAUNAWILI

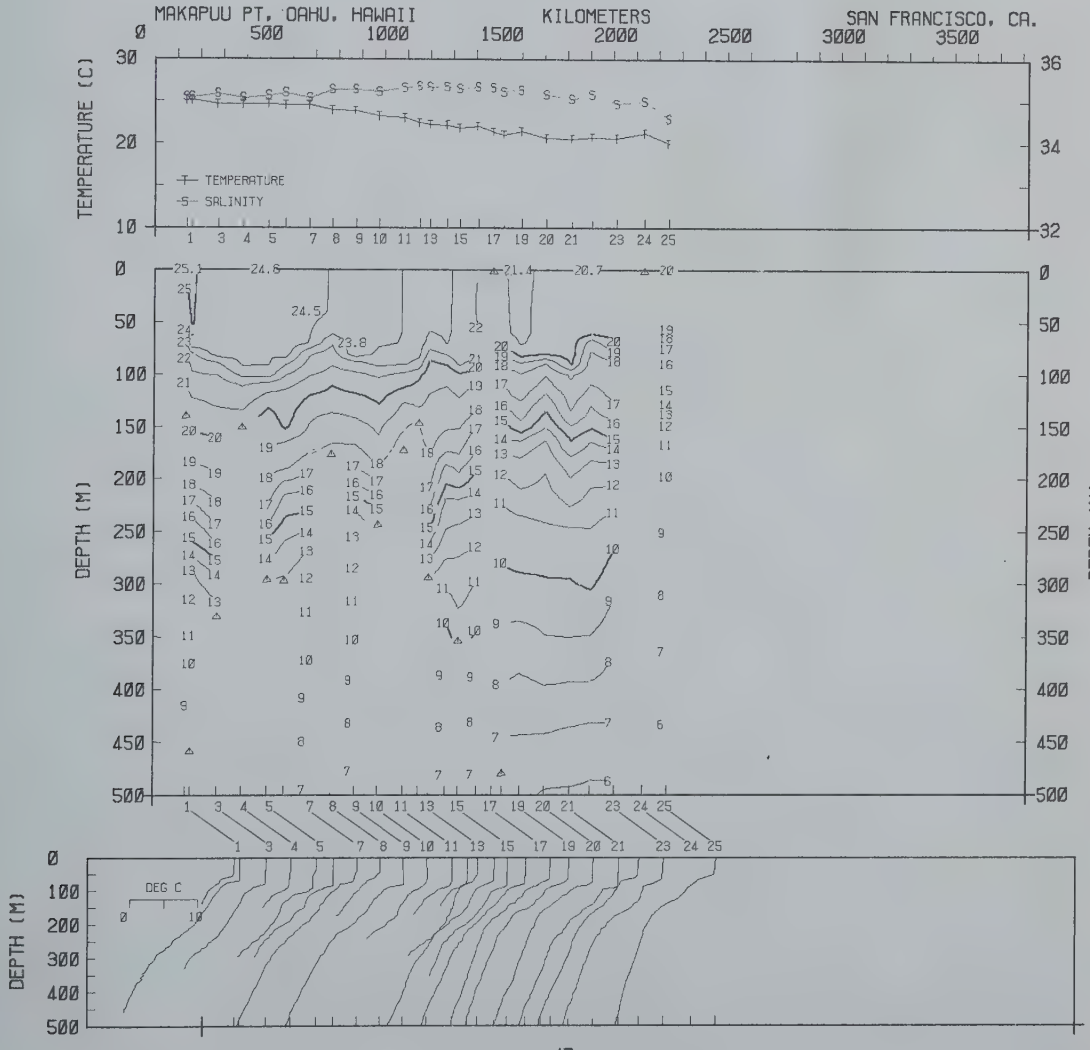
VOYAGE 260E

MAKAPUU PT, OAHU, HAWAII

- SAN FRANCISCO, CA.

02 DEC 1979 - 07 DEC 1979

NOAA-NMFS PEG MONTEREY, CA.



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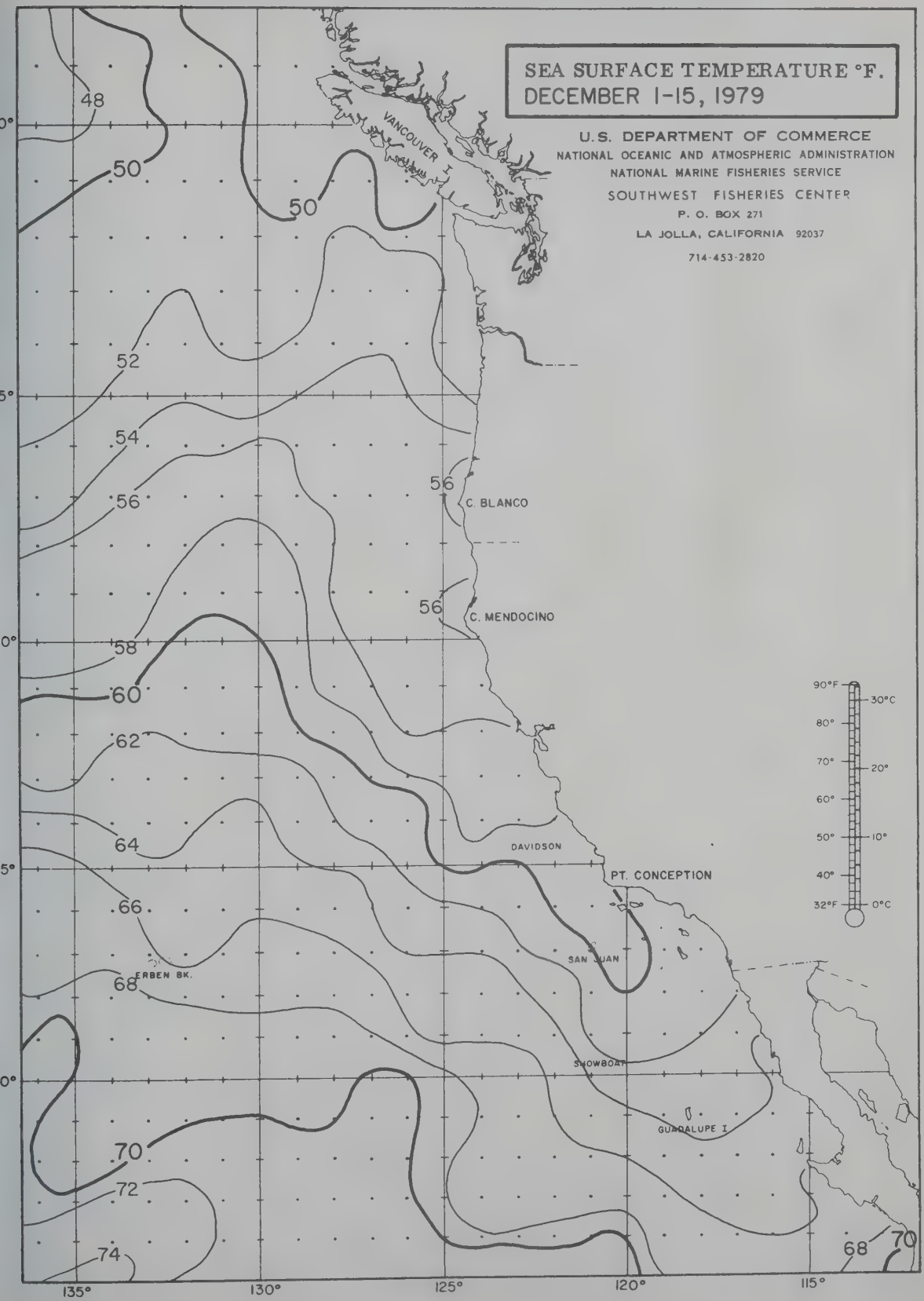

FISHING INFORMATION – supplement